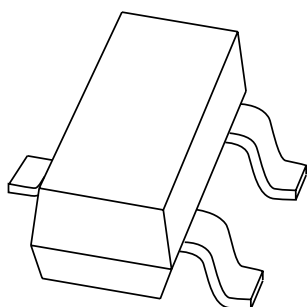


# DATA SHEET



## **BSH102**

N-channel enhancement mode  
MOS transistor

Product specification  
Supersedes data of 1997 Jun 19  
File under Discrete Semiconductors, SC13b

1997 Dec 08

# N-channel enhancement mode MOS transistor

## BSH102

### FEATURES

- Very low threshold
- High-speed switching
- No secondary breakdown
- Direct interface to C-MOS, TTL etc.

### APPLICATIONS

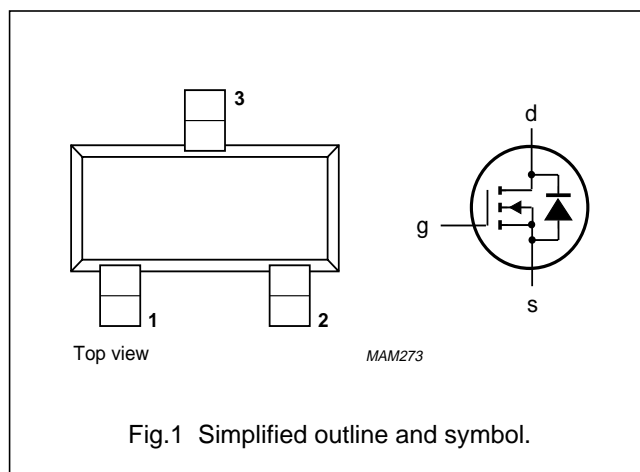
- Power management
- DC to DC converters
- Battery powered applications
- 'Glue-logic'; interface between logic blocks and/or periphery
- General purpose switch.

### DESCRIPTION

N-channel enhancement mode MOS transistor in a SOT23 SMD package.

### PINNING - SOT23

PIN	SYMBOL	DESCRIPTION
1	g	gate
2	s	source
3	d	drain



### QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{DS}$	drain-source voltage (DC)		–	30	V
$V_{SD}$	source-drain diode forward voltage	$V_{GD} = 0$ ; $I_S = 0.5$ A	–	1	V
$V_{GS}$	gate-source voltage (DC)		–	$\pm 20$	V
$V_{GSth}$	gate-source threshold voltage	$V_{DS} = V_{GS}$ ; $I_D = 1$ mA	1	–	V
$I_D$	drain current (DC)	$T_s = 80$ °C	–	0.85	A
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10$ V; $I_D = 0.5$ A	–	0.4	$\Omega$
$P_{tot}$	total power dissipation	$T_s = 80$ °C	–	0.5	W

### CAUTION

This product is supplied in anti-static packing to prevent damage caused by electrostatic discharge during transport and handling. For further information, refer to Philips specs.: SNW-EQ-608, SNW-FQ-302A and SNW-FQ-302B.

N-channel enhancement mode  
MOS transistor

BSH102

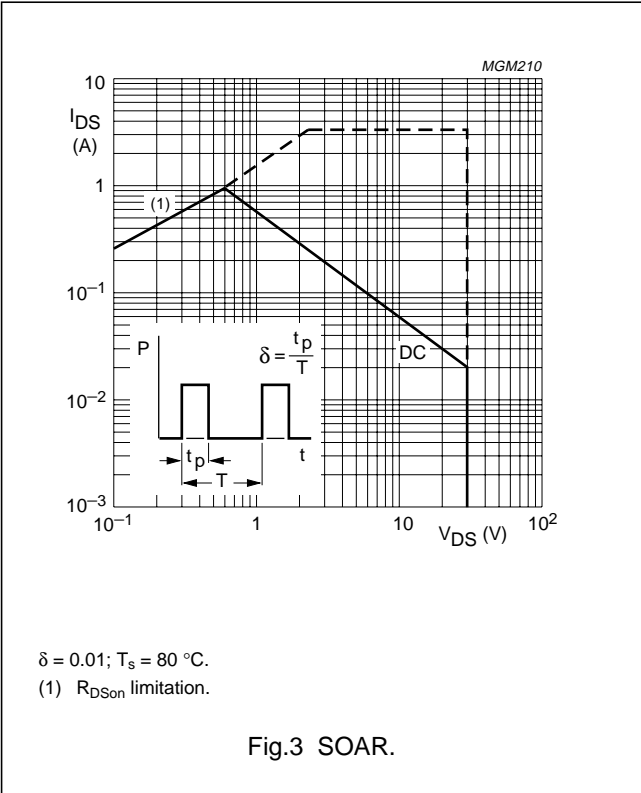
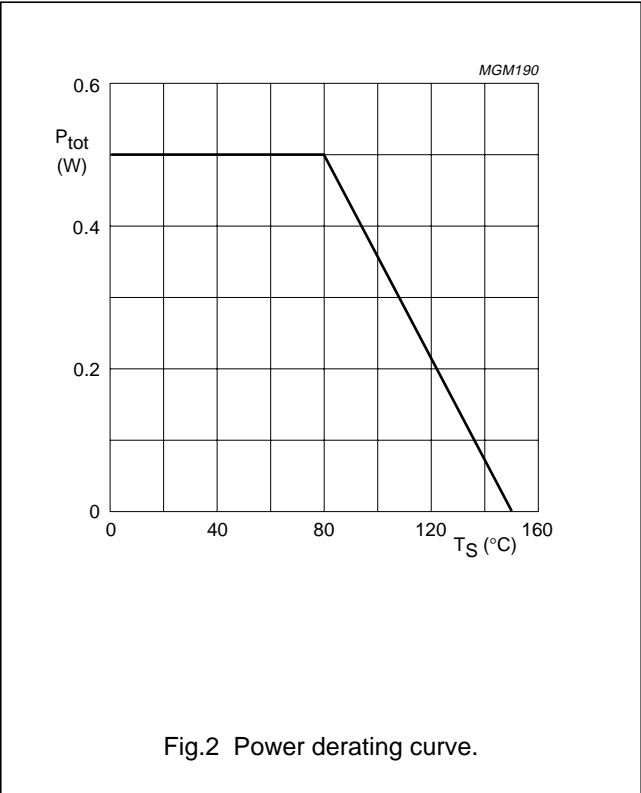
**LIMITING VALUES**

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{DS}$	drain-source voltage (DC)		–	30	V
$V_{GS}$	gate-source voltage (DC)		–	$\pm 20$	V
$I_D$	drain current (DC)	$T_s = 80\text{ }^{\circ}\text{C}$ ; note 1	–	0.85	A
$I_{DM}$	peak drain current	note 2	–	3.4	A
$P_{tot}$	total power dissipation	$T_s = 80\text{ }^{\circ}\text{C}$	–	0.5	W
		$T_{amb} = 25\text{ }^{\circ}\text{C}$ ; note 3	–	0.75	W
		$T_{amb} = 25\text{ }^{\circ}\text{C}$ ; note 4	–	0.54	W
$T_{stg}$	storage temperature		–55	+150	$^{\circ}\text{C}$
$T_j$	operating junction temperature		–55	+150	$^{\circ}\text{C}$
<b>Source-drain diode</b>					
$I_S$	source current (DC)	$T_s = 80\text{ }^{\circ}\text{C}$	–	0.5	A
$I_{SM}$	peak pulsed source current	note 2	–	2	A

**Notes**

1.  $T_s$  is the temperature at the soldering point of the drain lead.
2. Pulse width and duty cycle limited by maximum junction temperature.
3. Device mounted on printed-circuit board with an  $R_{th\text{ a-tp}}$  (ambient to tie-point) of 27.5 K/W.
4. Device mounted on printed-circuit board with an  $R_{th\text{ a-tp}}$  (ambient to tie-point) of 90 K/W.

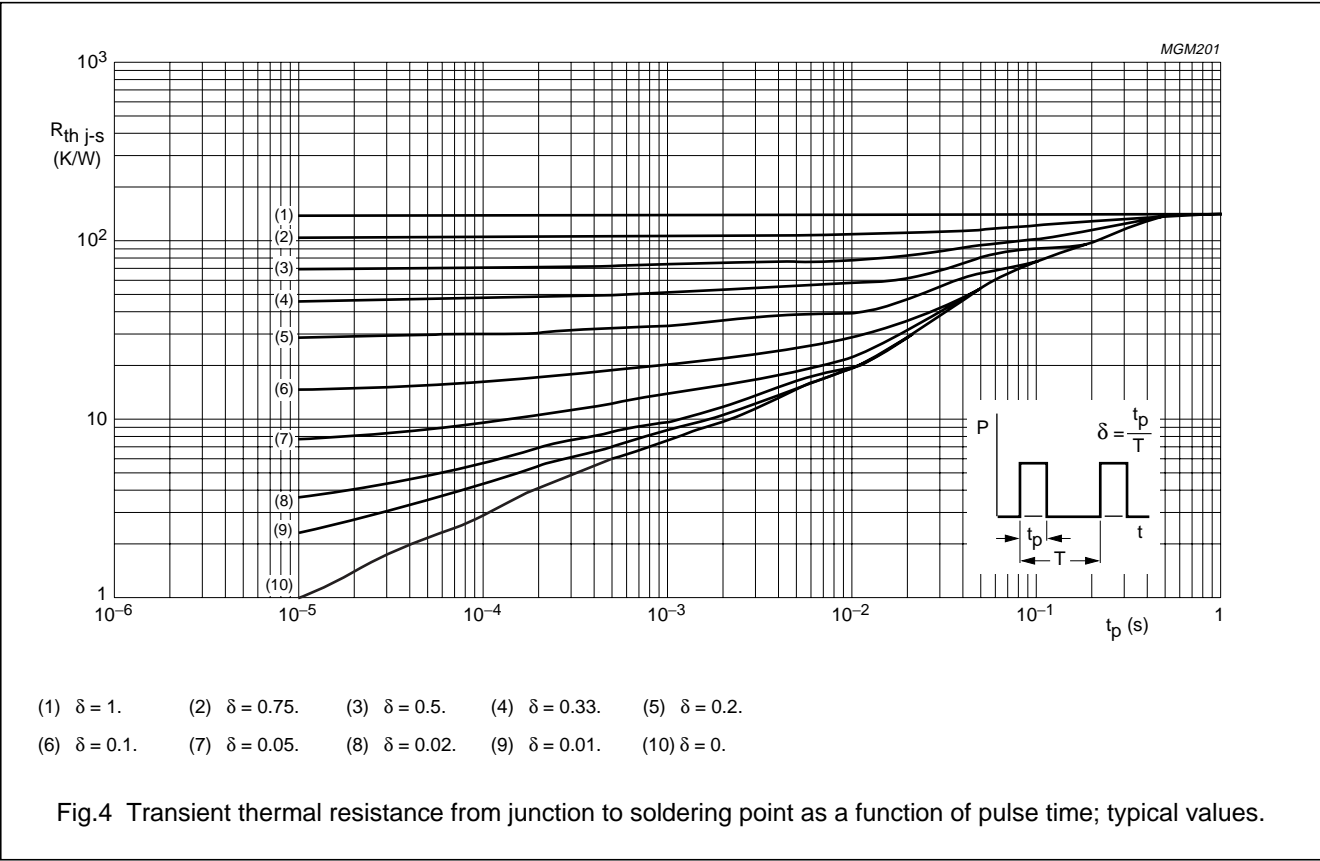


N-channel enhancement mode  
MOS transistor

BSH102

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j-s}$	thermal resistance from junction to soldering point	140	K/W



# N-channel enhancement mode MOS transistor

BSH102

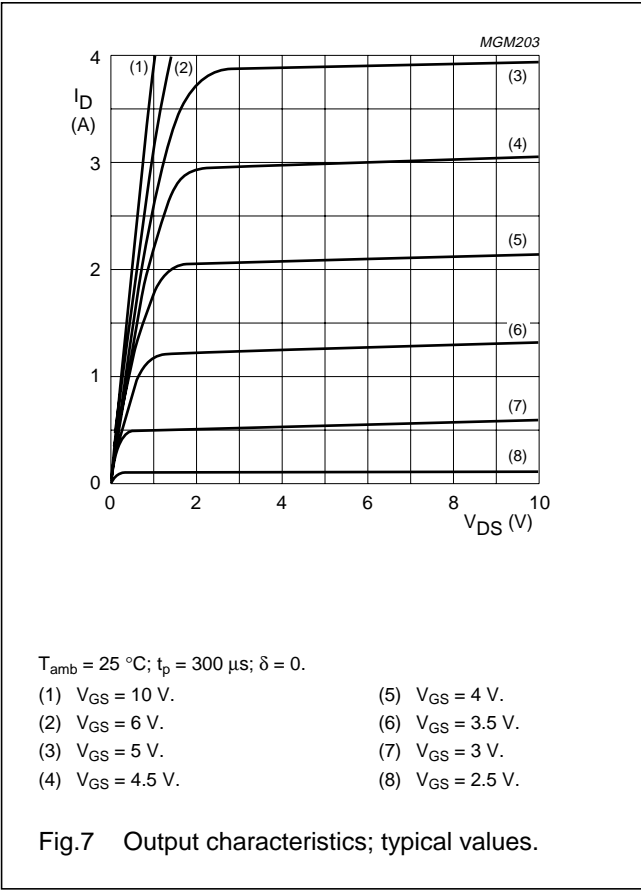
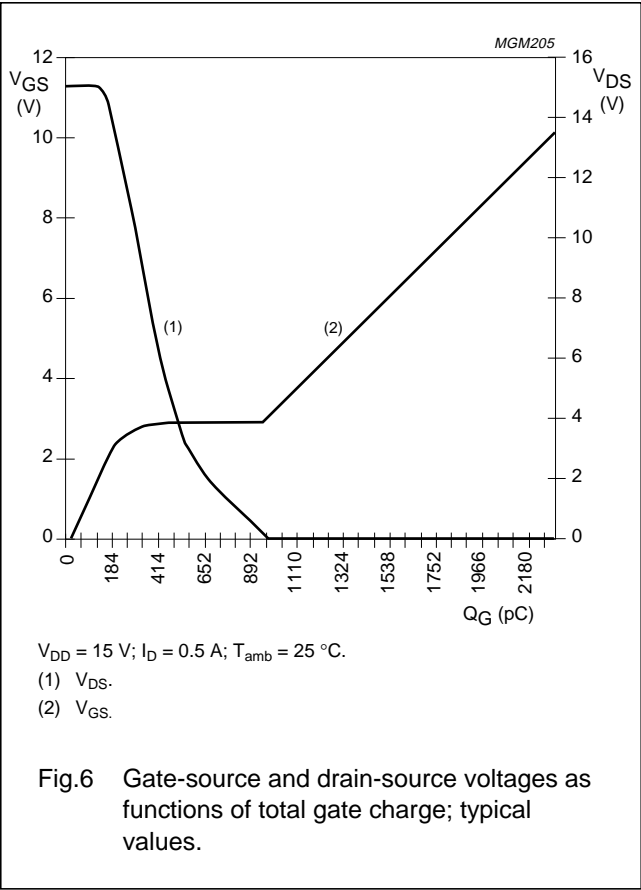
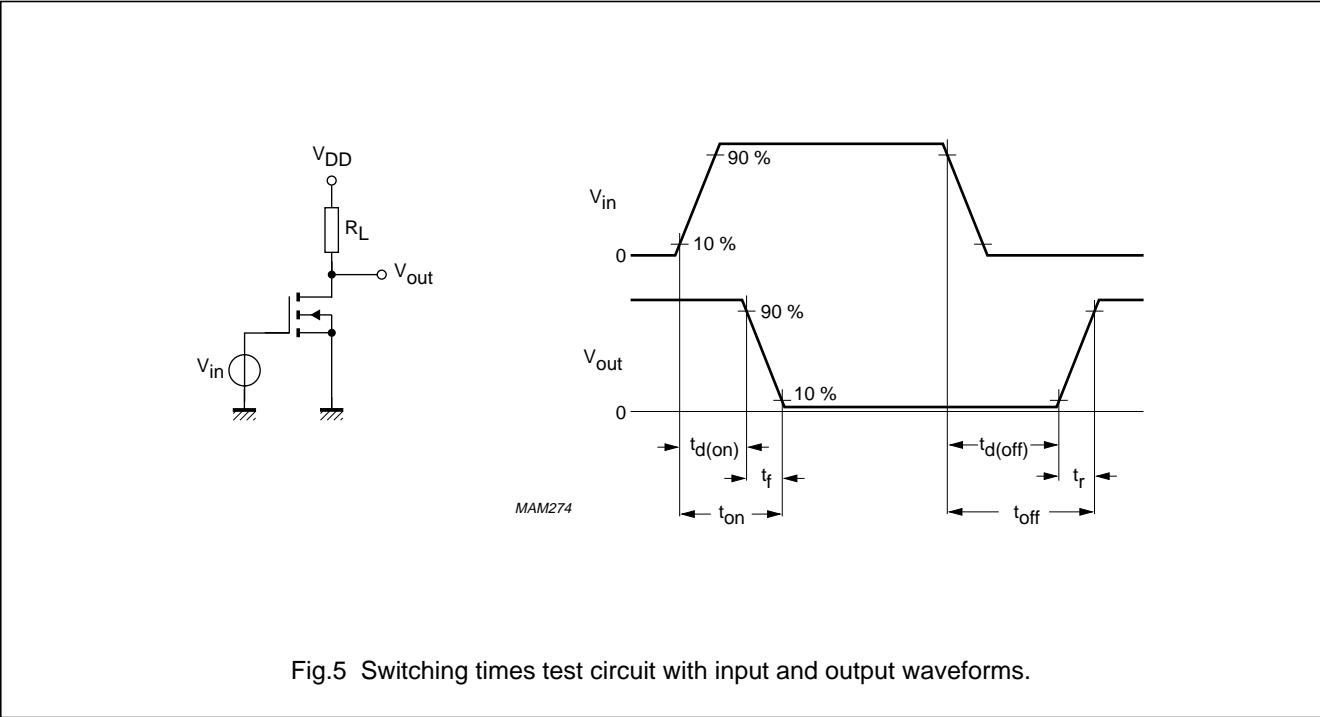
## CHARACTERISTICS

$T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0$ ; $I_D = 10\text{ }\mu\text{A}$	30	–	–	V
$V_{GSth}$	gate-source threshold voltage	$V_{GS} = V_{DS}$ ; $I_D = 1\text{ mA}$	1	–	–	V
$I_{DSS}$	drain-source leakage current	$V_{GS} = 0$ ; $V_{DS} = 24\text{ V}$	–	–	100	nA
$I_{GSS}$	gate leakage current	$V_{GS} = \pm 20\text{ V}$ ; $V_{DS} = 0$	–	–	$\pm 100$	nA
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$ ; $I_D = 0.5\text{ A}$	–	–	0.4	$\Omega$
		$V_{GS} = 4.5\text{ V}$ ; $I_D = 0.25\text{ A}$	–	–	0.6	$\Omega$
$C_{iss}$	input capacitance	$V_{GS} = 0$ ; $V_{DS} = 24\text{ V}$ ; $f = 1\text{ MHz}$	–	67	–	pF
$C_{oss}$	output capacitance	$V_{GS} = 0$ ; $V_{DS} = 24\text{ V}$ ; $f = 1\text{ MHz}$	–	27	–	pF
$C_{rss}$	reverse transfer capacitance	$V_{GS} = 0$ ; $V_{DS} = 24\text{ V}$ ; $f = 1\text{ MHz}$	–	13	–	pF
$Q_G$	total gate charge	$V_{GS} = 10\text{ V}$ ; $V_{DD} = 15\text{ V}$ ; $I_D = 0.5\text{ A}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$	–	2290	–	pC
$Q_{GS}$	gate-source charge	$V_{DD} = 15\text{ V}$ ; $I_D = 0.5\text{ A}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$	–	150	–	pC
$Q_{GD}$	gate-drain charge	$V_{DD} = 15\text{ V}$ ; $I_D = 0.5\text{ A}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$	–	780	–	pC
<b>Switching times</b>						
$t_{d(on)}$	turn-on delay time	$V_{GS} = 0\text{ to }10\text{ V}$ ; $V_{DD} = 15\text{ V}$ ; $I_D = 0.5\text{ A}$ ; $R_{gen} = 6\text{ }\Omega$	–	3.5	–	ns
$t_f$	fall time	$V_{GS} = 0\text{ to }10\text{ V}$ ; $V_{DD} = 15\text{ V}$ ; $I_D = 0.5\text{ A}$ ; $R_{gen} = 6\text{ }\Omega$	–	4	–	ns
$t_{on}$	turn-on switching time	$V_{GS} = 0\text{ to }10\text{ V}$ ; $V_{DD} = 15\text{ V}$ ; $I_D = 0.5\text{ A}$ ; $R_{gen} = 6\text{ }\Omega$	–	7.5	–	ns
$t_{d(off)}$	turn-off delay time	$V_{GS} = 10\text{ to }0\text{ V}$ ; $V_{DD} = 15\text{ V}$ ; $I_D = 0.5\text{ A}$ ; $R_{gen} = 6\text{ }\Omega$	–	8	–	ns
$t_r$	rise time	$V_{GS} = 10\text{ to }0\text{ V}$ ; $V_{DD} = 15\text{ V}$ ; $I_D = 0.5\text{ A}$ ; $R_{gen} = 6\text{ }\Omega$	–	3	–	ns
$t_{off}$	turn-off switching time	$V_{GS} = 10\text{ to }0\text{ V}$ ; $V_{DD} = 15\text{ V}$ ; $I_D = 0.5\text{ A}$ ; $R_{gen} = 6\text{ }\Omega$	–	11	–	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain diode forward voltage	$V_{GD} = 0$ ; $I_S = 0.5\text{ A}$	–	–	1	V
$t_{rr}$	reverse recovery time	$I_S = 0.5\text{ A}$ ; $di/dt = -100\text{ A}/\mu\text{s}$	–	25	–	ns

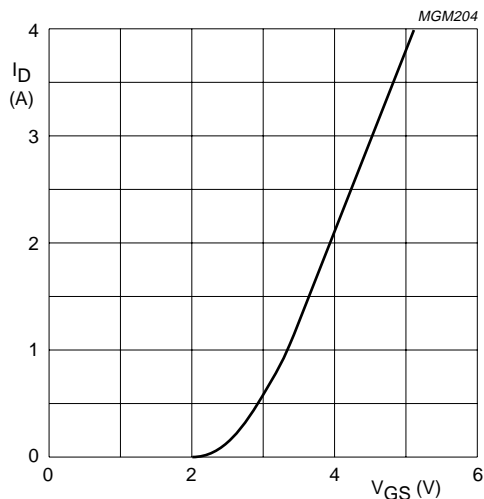
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MOS transistor

BSH102



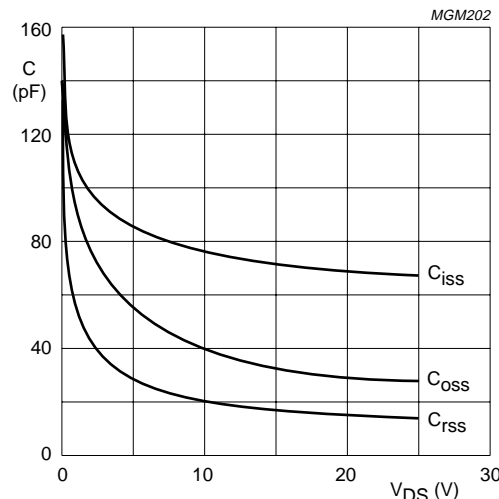
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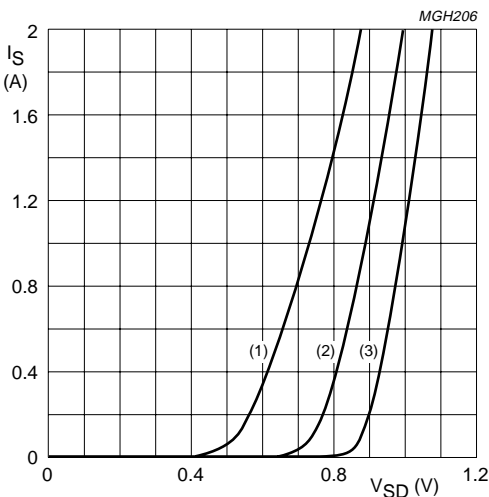
$V_{DS} = 10$  V;  $T_{amb} = 25$  °C;  $t_p = 300$   $\mu$ s;  $\delta = 0$ .

Fig.8 Transfer characteristic; typical values.



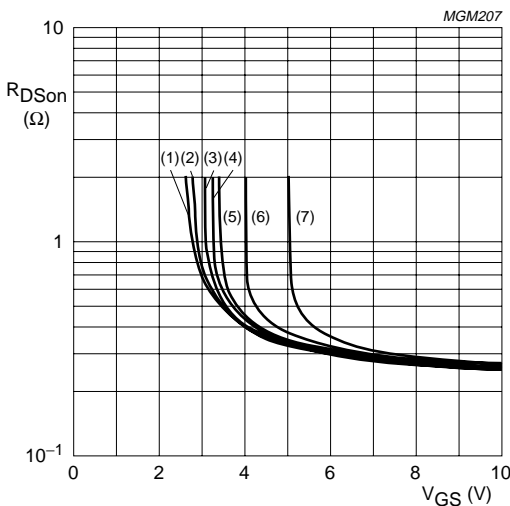
$V_{GS} = 0$  ;  $f = 1$  MHz;  $T_{amb} = 25$  °C.

Fig.9 Capacitance as a function of drain-source voltage; typical values.



$V_{GD} = 0$ .  
(1)  $T_{amb} = 150$  °C.  
(2)  $T_{amb} = 25$  °C.  
(3)  $T_{amb} = -65$  °C.

Fig.10 Source current as a function of source-drain diode forward voltage; typical values.

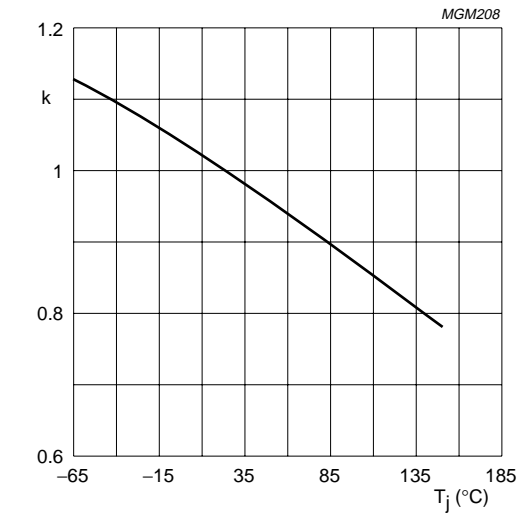


$T_{amb} = 25$  °C;  $t_p = 300$   $\mu$ s;  $\delta = 0$ .  
(1)  $I_D = 0.1$  A. (4)  $I_D = 0.75$  A.  
(2)  $I_D = 0.25$  A. (5)  $I_D = 1$  A.  
(3)  $I_D = 0.5$  A. (6)  $I_D = 2$  A.  
(7)  $I_D = 4$  A.

Fig.11 Drain-source on-state resistance as a function of gate-source voltage; typical values.

N-channel enhancement mode  
MOS transistor

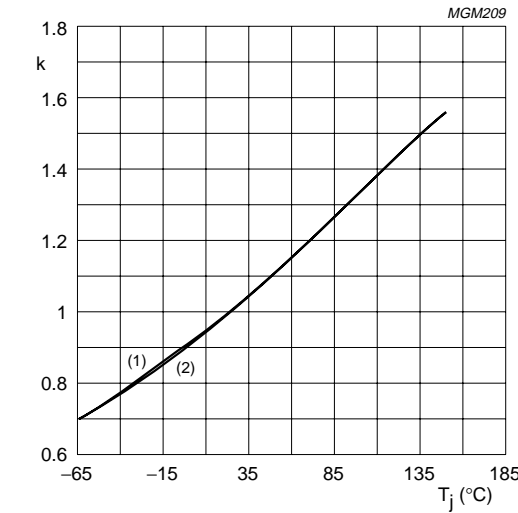
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$$k = \frac{V_{GSth} \text{ at } T_j}{V_{GSth} \text{ at } 25^{\circ}\text{C}}$$

$V_{GSth}$  at  $V_{DS} = V_{GS}$ ;  $I_D = 1 \text{ mA}$ .

Fig.12 Temperature coefficient of gate-source threshold voltage as a function of junction temperature; typical values.



$$k = \frac{R_{DSon} \text{ at } T_j}{R_{DSon} \text{ at } 25^{\circ}\text{C}}$$

(1)  $R_{DSon}$  at  $V_{GS} = 10 \text{ V}$ ;  $I_D = 0.5 \text{ mA}$ .  
(2)  $R_{DSon}$  at  $V_{GS} = 4.5 \text{ V}$ ;  $I_D = 0.25 \text{ mA}$ .

Fig.13 Temperature coefficient of drain-source on-resistance as a function of junction temperature; typical values.



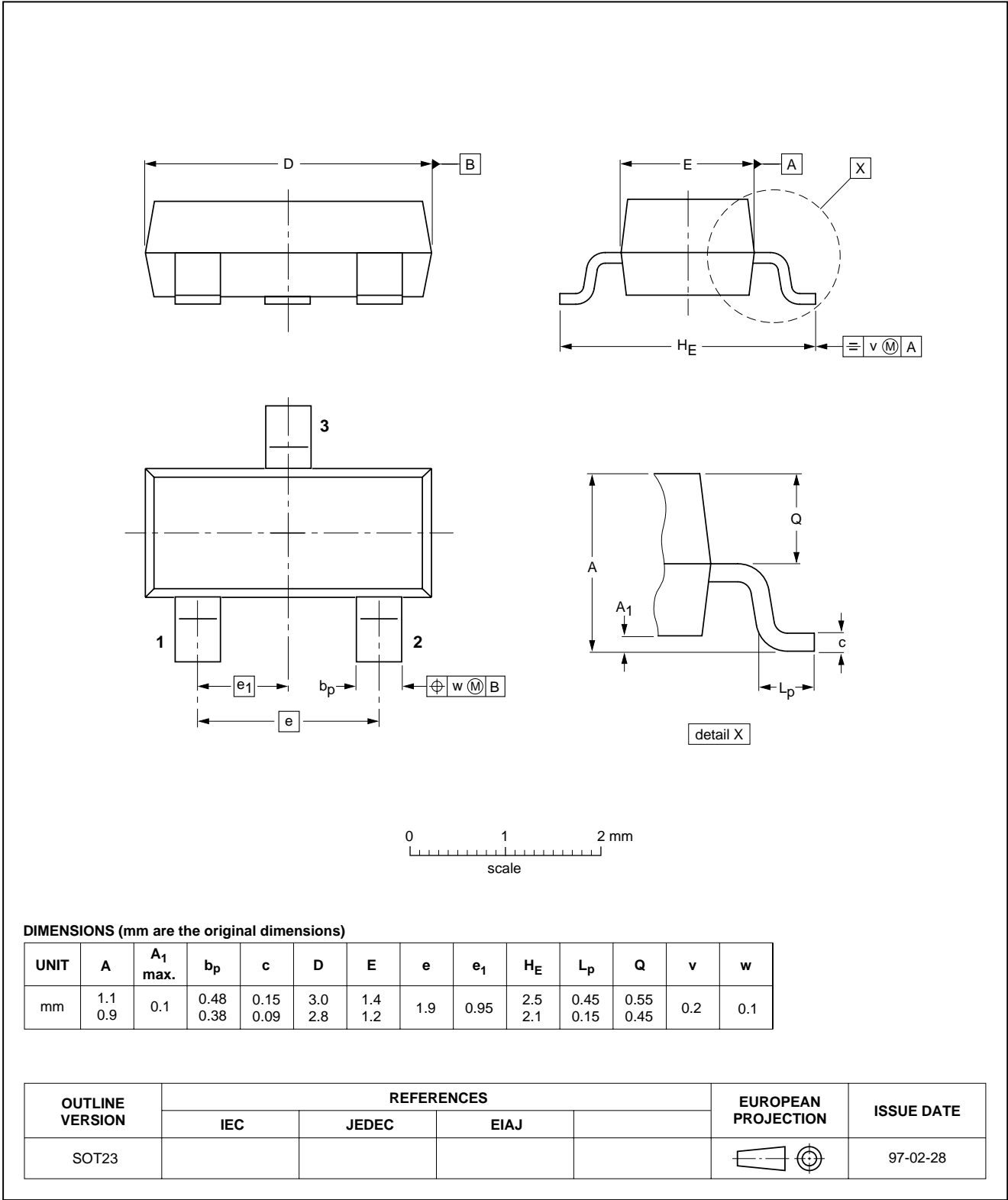
N-channel enhancement mode  
MOS transistor

BSH102

PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT23



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# N-channel enhancement mode MOS transistor

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BSH102

**DEFINITIONS**

<b>Data Sheet Status</b>	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
<b>Limiting values</b>	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

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N-channel enhancement mode  
MOS transistor

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**NOTES**

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